

1. A method of making a polymer layer having a selected index of refraction, the method using plasma enhanced chemical vapor deposition onto a substrate in a vacuum environment, comprising:

- 5 (a) providing a polymer precursor cross linkable into a polymer with the selected index of refraction;
- (b) making an evaporate by receiving a plurality of polymer precursor particles as a spray into a flash evaporation housing, evaporating the polymer precursor on an evaporation surface, and discharging the evaporate through an evaporate outlet;
- 10 (c) making a polymer precursor plasma from the evaporate by passing the evaporate proximate a glow discharge electrode; and
- (d) cryocondensing the polymer precursor plasma onto the substrate as a condensate and crosslinking the condensate thereon, forming the polymer layer having the selected index of refraction.

2. The method as recited in claim 1, wherein the substrate is proximate the glow discharge electrode, and is electrically biased with an impressed voltage.

3. The method as recited in claim 1, wherein the glow discharge electrode is positioned within a glow discharge housing having an evaporate inlet proximate the evaporate outlet, the glow discharge housing and the glow discharge electrode maintained at a temperature above a dew point of the evaporate, and the substrate is downstream of the polymer precursor plasma,
5 and is electrically floating.

4. The method as recited in claim 1, wherein the substrate is proximate the glow discharge electrode, and is electrically grounded.

5. The method as recited in claim 1, wherein the polymer precursor is selected from the group consisting of halogenated alkyl polymer precursors, diallyldiphenylsilane, 1,3-

divinyltetramethyldisiloxane, (meth)acrylate polymer precursors, and phenylacetylene, and combinations thereof.

6. The method as recited in claim 1, wherein the substrate is cooled.
7. The method as recited in claim 1, further comprising adding an additional gas to the evaporate.
8. The method as recited in claim 7, wherein the additional gas is a ballast gas.
9. The method as recited in claim 7, wherein the additional gas is a reaction gas.
10. The method as recited in claim 9, wherein the reaction gas is oxygen gas.
11. The method as recited in claim 1, further comprising particles selected from the group consisting of organic solids, liquids, and combinations thereof.
12. The method as recited in claim 11, wherein the organic solids are selected from the group consisting of biphenyl, triphenyl diamine derivatives, quinacridone derivatives, and metal (8-quinolinolato) chelates, and combinations thereof.
13. A method for making a polymer layer of a polymer with a selected index of refraction in a vacuum chamber, comprising:
 - (a) flash evaporating a polymer precursor material capable of cross linking into the polymer with the selected index of refraction, forming an evaporate;
 - 5 (b) passing the evaporate to a glow discharge electrode creating a glow discharge polymer precursor plasma from the evaporate;
 - (c) cryocondensing the glow discharge polymer precursor plasma on a substrate as a condensate and crosslinking the condensate thereon, the crosslinking resulting from

radicals created in the glow discharge polymer precursor plasma, forming the polymer layer
10 having the selected index of refraction.

14. The method as recited in claim 13, wherein the substrate is proximate the glow discharge electrode, and is electrically biased with an impressed voltage.

15. The method as recited in claim 13, wherein the glow discharge electrode is positioned within a glow discharge housing having an evaporate inlet proximate the evaporate outlet, the glow discharge housing and the glow discharge electrode maintained at a temperature above a dew point of the evaporate, and the substrate is downstream of the polymer precursor plasma,
5 and is electrically floating.

16. The method as recited in claim 13, wherein the substrate is proximate the glow discharge electrode and is electrically grounded.

17. The method as recited in claim 13, wherein the polymer precursor material is a conjugated polymer precursor.

18. The method as recited in claim 13, wherein the polymer precursor material is selected from the group consisting of halogenated alkyl polymer precursors, diallyldiphenylsilane, 1,3-divinyltetramethyldisiloxane, (meth)acrylate polymer precursors, and phenylacetylene, and combinations thereof.

19. The method as recited in claim 13, wherein the substrate is cooled.

20. The method as recited in claim 13, wherein the polymer precursor material is a polymer precursor containing particles.

21. The method as recited in claim 20, wherein the polymer precursor is a conjugated polymer precursor.
22. The method as recited in claim 20, wherein the particles are selected from the group consisting of organic solids, liquids, and combinations thereof.
23. The method as recited in claim 22, wherein the organic solids are selected from the group consisting of biphenyl, triphenyl diamine derivatives, quinacridone derivatives, and metal (8-quinolinolato) chelates, and combinations thereof.
24. The method as recited in claim 1, wherein flash evaporating comprises:
- (a) supplying a continuous liquid flow of the polymer precursor material into a vacuum environment at a temperature below both the decomposition temperature and the polymerization temperature of the polymer precursor material;
 - (b) continuously atomizing the polymer precursor material into a continuous flow of droplets; and
 - (c) continuously vaporizing the droplets by continuously contacting the droplets on a heated surface having a temperature at or above a boiling point of the polymer precursor material, but below a pyrolysis temperature, forming the evaporate.
25. The method as recited in claim 24 wherein the droplets range in size from about 1 micrometer to about 50 micrometers.
26. The method as recited in claim 1 wherein flash evaporating comprises:
- (a) supplying a continuous liquid flow of the polymer precursor material into a vacuum environment at a temperature below both the decomposition temperature and the polymerization temperature of the polymer precursor material; and
 - (b) continuously directly vaporizing the liquid flow of the polymer precursor material by continuously contacting the polymer precursor material on a heated surface having a temperature

at or above a boiling point of the polymer precursor material, but below a pyrolysis temperature, forming the evaporate.